What Are Redox Reactions?

Worksheet

Oxidation is loss of electrons (increase in oxidation number); reduction is gain of electrons (decrease in oxidation number). In redox reactions, the reducing agent is oxidized and the oxidizing agent is reduced. The half-reaction method separates oxidation and reduction steps, balancing atoms and then electrons.

Questions

1. In KMnO, Mn's oxidation number is

A) +3
B) +4
C) +7
D) +2

2. Which is oxidized in: 2Cu + O 2CuO?

A) Oxygen
B) Copper
C) Both equally
D) Neither

3. In redox reactions, the reducing agent is

A) Reduced
B) Oxidized
C) Neither
D) Both

4. Balancing MnO in acidic solution - Mn gains how many e?

A) 3
B) 4
C) 5
D) 7

5. Balance the redox reaction: Fe + MnO Fe + Mn in acidic solution.

6. Identify which element is oxidized and which is reduced: 2HS + SO 3S + 2HO

7. Balance in basic solution: CrO + Fe Cr + Fe

8. Define: What is oxidation?

9. Define: What is reduction?

10. Define: Oxidation number rules?

Answer Key

1. C) +7 - K(+1), O(-2) each. Mn: +1 + Mn + 4(-2) = 0 Mn = +7.

2. B) Copper - Cu: 0 +2 (loses 2e, oxidized). O: 0 -2 (gains 2e, reduced).

3. B) Oxidized - The reducing agent is the species that loses electrons, so it is oxidized.

4. C) 5 - Mn goes from +7 in MnO to +2 in Mn gains 5e.

5. Step 1: Oxidation numbers - Fe (starts +2) Fe (ends +3), Mn in MnO (starts +7) Mn (ends +2) Step 2: Half-reactions: Oxidation: Fe Fe + e Reduction: MnO Mn (Mn: +7 to +2, gains 5e) MnO + 8H + 5e Mn + 4HO Step 3: Balance electrons - multiply oxidation by 5: 5Fe 5Fe + 5e Step 4: Add half-reactions: 5Fe + MnO + 8H 5Fe + Mn + 4HO

6. Oxidation numbers: HS: S is -2 SO: S is +4 S (product): S is 0 In HS: S goes -2 0 (loses 2e, OXIDIZED) In SO: S goes +4 0 (gains 4e, REDUCED) HS is the reducing agent (oxidized) SO is the oxidizing agent (reduced)

7. Half-reactions (acidic first): Oxidation: Fe Fe + e (multiply by 6 for Cr) Reduction: CrO + 14H + 6e 2Cr + 7HO Combine: 6Fe + CrO + 14H 6Fe + 2Cr + 7HO Convert to basic by adding OH to neutralize H: 6Fe + CrO + 14H + 14OH 6Fe + 2Cr + 7HO + 14OH Simplify: 6Fe + CrO + 7HO 6Fe + 2Cr + 14OH

8. Loss of electrons; oxidation number increases. The species being oxidized is the reducing agent.

9. Gain of electrons; oxidation number decreases. The species being reduced is the oxidizing agent.

10. Element = 0; monoatomic ion = charge; O usually -2 (except peroxides -1); H usually +1; sum = charge/zero for molecule/ion.